

**REMARKS**

This application has been amended so as to place it in condition for allowance at the time of the next Office Action.

The Office Action rejects Claims 13, 21-22, 25-27, and 34 under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 4,605,685 by Momose et al., in view of US Patent Pub. No. 2003/0054219 by Won et al. and US Patent Pub. No. 2004/0106044 by Kerres.

Reconsideration and withdrawal of this rejection are respectfully requested for the following reasons:

Of the rejected claims, only claims 13 and 21 are independent. Applicants have amended each of claims 13 and 21 to recite additional features. Specifically, such claims now recite that the ion conducting membrane is coated (claim 13) or impregnated (claim 21) with an ionically conducting polymeric phase. This feature was previously recited in each of claims 18 and 30, which claims were not included in the present rejection. For at least this reason, reconsideration and withdrawal of the present rejection is appropriate, and the same is requested.

The Office Action rejects Claims 14-16, 18-19, 29-31, and 36 under 35 U.S.C. 103(a) as being unpatentable over US Patent No. 4,605,685 by Momose et al., in view of US Patent Pub. No. 2003/0054219 by Won et al. and US Patent Pub. No. 2004/0106044 by

Kerres, as applied to claims 13, 21-22, 25-27, and 34 above, and further in view of US Patent No. 5,656,386 by Scherer et al.

Reconsideration and withdrawal of this rejection are respectfully requested for the following reasons:

As noted above, each of independent claims 13 and 21 recites a feature of rejected claims 18 and 30. It is for the features of such claims that the Office Action offers the additionally recited Scherer reference. The combination of such reference with the remaining applied references fails to render the claimed invention obvious, however.

At the outset, Applicants note that the interpretation of the applied references clearly demonstrates a hindsight view offered by the disclosure of the present invention. The teaching of Kerres in particular is arbitrarily combined with the features given by Momose et al. and Won et al. It is of particular note that Kerres has as its specific purpose to offer improvements over the systems and membranes of the known prior art. Kerres specifically points out that in the prior art according to paragraphs [0001] to [0016] of such reference "present poor thermal and mechanical stability, which especially impinges on regions above a temperature of 100°C." Therefore, there exists a need to improve the water holding ability even at temperatures of larger than 100°C which is important in particular for the

application in membrane fuel cells in the temperature range larger than 100°C.

This highlights a significant difference consists between the teachings of Kerres and the present invention. This flows from the fact that the present invention is used to build a PEM fuel cell being operated below the boiling temperature of water, since the liquid water content in the membrane is essential to maintain the conductivity of the membrane.

Therefore, the scope of the present invention is quite different from the teachings of the applied references. The present device is a membrane that transforms ionomers coated/impregnated on the surface of the ion-conducting membrane into the form of an insoluble solid. This is not at all disclosed by the applied references.

To further highlight the distinction between the present invention and the teaching of the prior art, Applicants have further amended each of independent claims 13 and 21 to recite a temperature range in the drying step of 120 to 140 °C. The amended lower limit of the range is disclosed in the specification as originally filed at least in the paragraph spanning pages 12 and 13. This further places the scope of these claims, and by extension all claims that depend therefrom, well

beyond the teachings of the known prior art, including the applied references.

Such amendment of claims 13 and 21 clearly focuses the such claims on the "petrification" of the ionically conducting polymeric phase on the surface of the ion-conducting membrane. This underlies the superior properties over the conventional membranes according to the example results given in Tables 1 and 2 of the present specification.

As the combination of applied references fails to render obvious the methods as now recited, Applicants respectfully suggest that the present rejections cannot be maintained, and reconsideration and withdrawal of such are therefore respectfully requested.

The Office Action rejects the following sets of claims as unpatentable over the identified prior art: claim 17 over US Patent No. 4,605,685 by Momose et al., in view of US Patent Pub. No. 2003/0054219 by Won et al. and US Patent Pub. No. 2004/0106044 by Kerres, as applied to claims 13,21-22,25-27, and 34 above, and further in view of US Patent Pub. No. 2004/0062970 by Nomura; claim 20 over US Patent No. 4,605,685 by Momose et al., in view of US Patent Pub. No. 2003/0054219 by Won et al., US Patent Pub. No. 2004/0106044 by Kerres and US Patent No. 5,656,386 by Scherer et al., as applied to claims 14-16, 18-

19,29-31, and 36 above, and further in view of US Patent Pub. No. 2004/0062970 by Nomura; and claims 23-24, 28, 32-33, and 35 over US Patent No. 4,605,685 by Momose et al., in view of US Patent Pub. No. 2003/0054219 by Won et al. and US Patent Pub. No. 2004/0106044 by Kerres, as applied to claims 13,21-22,25-27, and 34 above, and further in view of US Patent Pub. No. 2004/0115499 by Tani et al.

The Office Action identifies those features for which the various additional references are offered. However, irrespective of the ability of such further references to teach or suggest that for which they are specifically offered, they nevertheless fail to overcome the shortcomings of the primary references considered in detail above. Accordingly, the reconsideration and withdrawal of such rejections are therefore respectfully requested as well.

**New claims**

In addition to the amendment to claims 13 and 21 discussed above, Applicants have added new claims 37 and 38. Of these, claim 37 is independent, with claim 38 depending therefrom.

Claims 37 and 38 recite features described at least in the section beginning on page 12, line 33, and continuing to page 14, line 21. These claims recite a set of steps that is entirely

absent from the known prior art, including the art now of record in this application.

No known prior art includes a combination of swelling a membrane by immersing it in an ionomer solution, drying the membrane at a temperature in a range from 120 to 140 °C so as to transform the ionomer into a form of an insoluble solid. This is then followed by re-swelling the membrane by immersing it in a solvent, then hot-pressing the membrane between electrode layers.

Beyond those features, claim 38 further recites that the hot-pressing step is performed while the ion-conducting membrane is still in a wet state from the re-swelling step.

Entry of the above amendments is earnestly solicited. An early and favorable first action on the merits is earnestly requested.

Should there be any matters that need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Please charge the fee of \$208.00 for the four (4) extra claims in excess of twenty added herewith to our credit card fees.

The Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment

to Deposit Account No. 25-0120 for any additional fees required  
under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17.

Respectfully submitted,

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